PESTS NOT KNOWN TO OCCUR IN THE UNITED STATES OR OF LIMITED DISTRIBUTION, NO. 51: CABBAGE THRIPS

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Pest

CABBAGE THRIPS
Thrips angusticeps Uzel

Order: Family

Thysanoptera: Thripidae

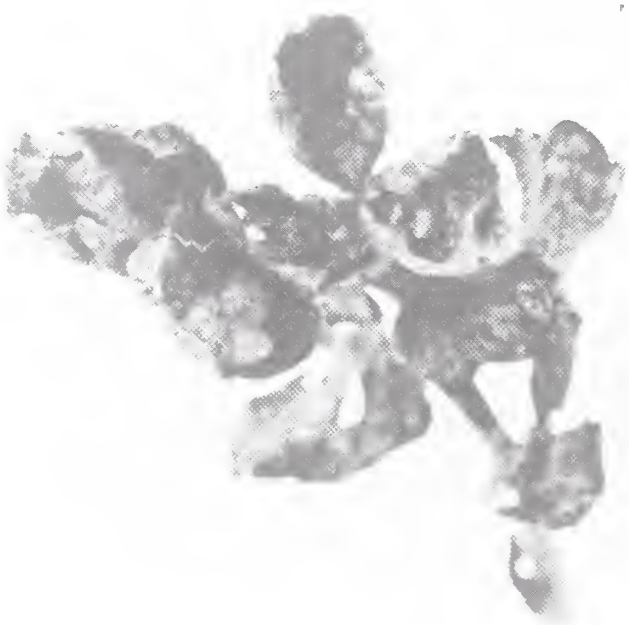
Economic Importance

A serious pest of flax in the Netherlands, this polyphagous thrips damages alfalfa, cereals, beets, peas, and other agricultural crops in Europe (Figs. 1-4). Damage is more severe when spring crops are planted in fields cropped during the previous summer with flax, peas, wheat, and barley (Franssen and Mantel 1963). Most damage is caused by brachypterous (short-winged) overwintering adults and by larvae of the macropterous (long-winged) summer generation, which attack the leaves, leaf sheaths, and growing terminals of seedlings and young plants. Plants may be killed by heavy infestations, and plants that survive may be retarded in growth or damaged to such an extent that the yield is reduced (Franssen and Mantel 1965).

(Fig. 1)

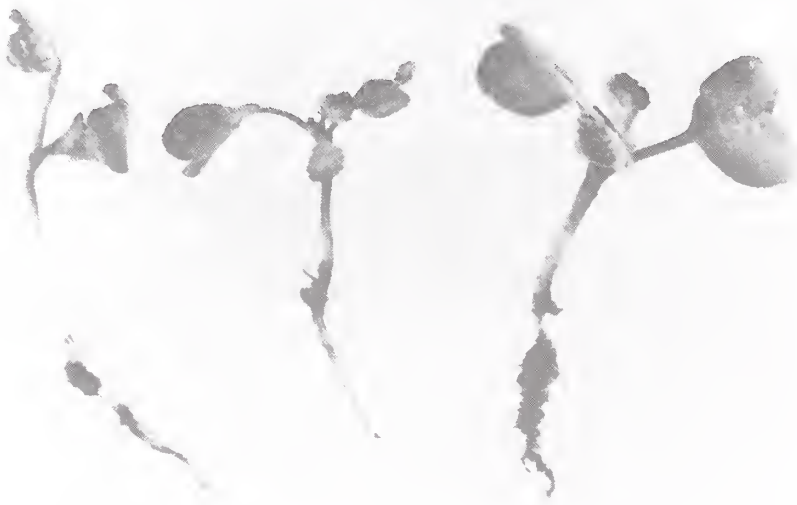
Thrips angusticeps damage to young pea plants. Left - damaged plant by brachypterous thrips. Right - healthy plant (From Franssen and Huisman 1958).

(Fig. 2)



Thrips angusticeps badly damaged young bean plant (From Franssen and Huisman 1958).

(Fig. 3)



Thrips angusticeps damage of radish plants. Left - damaged plants. Right - healthy plant (From Franssen and Huisman 1958).

(Fig. 4)

Thrips angusticeps damage to barley leaves (From Franssen and Huisman 1958). Figs. 1-4 photographs made by the Plant Protection Service, Wageningen, The Netherlands. Reproduced with permission of the Research Institute for Plant Protection, Wageningen, The Netherlands.

Winter crops, such as caraway, oats, and rape, are not damaged by brachypterous adults. Feeding may injure, however, other winter cereals, alfalfa, and clover, and impair growth (Franssen and Huisman 1958). Continued feeding may kill wheat plants (Franssen and Mantel 1965).

Young flax plants are killed by heavy infestations of brachypterous adults, and even slightly infested plants are damaged. The plants have silvery spots on the stems and are shorter than uninfested plants. When the stems are processed, the fiber breaks at these spots. Terminals of larger or less infested plants may be killed or retarded in growth, which cause the plants to ramify (Fig. 5). Ramified (branched) flax

(Fig. 5)

Thrips angusticeps damage to flax: Right - ramified plants. Left - healthy plants (From Franssen and Huisman 1958). Photograph made by Plant Protection Service, Wageningen, The Netherlands. Reproduced with the permission of the Research Institute for Plant Protection, Wageningen, The Netherlands.

plants are unsuitable for fiber production (Franssen and Mantel 1962). In England, peas are occasionally severely damaged in spring when grown in fields cropped during the previous summer with brassicas and brassica seed crops. Damage is intensified when growth is retarded by cold or very dry weather. The growth of the seedlings is retarded and the leaves are puckered and blotched with yellow (Ministry of Agriculture, Fisheries and Food 1981). Germination of brussels-sprouts was checked or terminated, and growing terminals of the few seedlings that germinated were damaged severely enough to retard growth (Jary 1934).

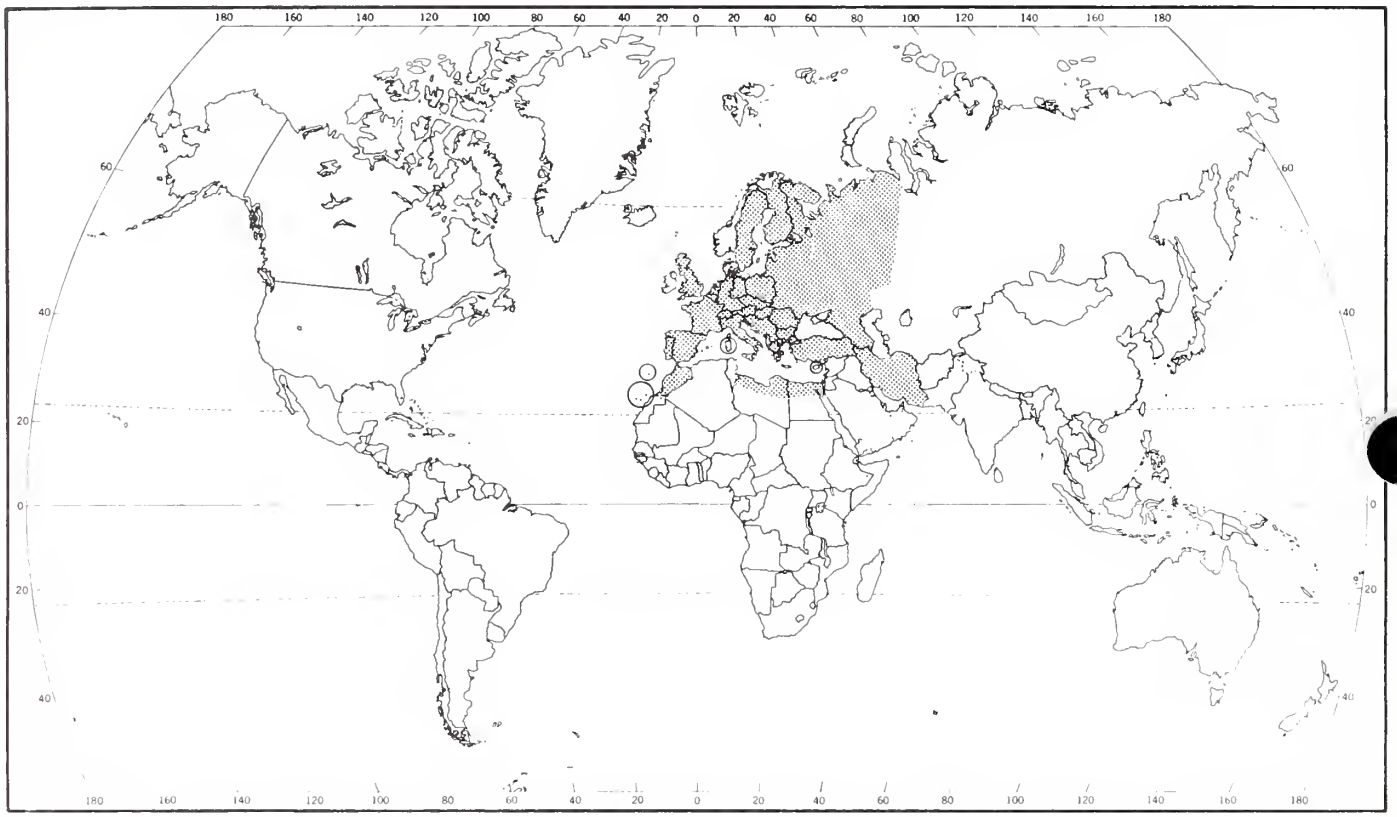
Macropterous adults and larvae of the brachypterous generation generally do not injure most crops. Both stages, however, damage alfalfa, and reduce seed production of some crops by feeding on the flowerbuds, ovaries, and immature seed pods. In the Netherlands, flax seed production was reduced by an average of 30 percent. Infested cereal crops produced grains fewer and smaller than produced by uninfested plants (Franssen and Mantel 1965). In Germany, this thrips attacked the inflorescences of four species of grasses and reduced seed production (Wetzel 1966).

Hosts

Brachypterous adults attack various host plants. Macropterous adults prefer Linum usitatissimum (flax), and to a lesser degree, Hordeum vulgare (barley), Pisum sativum (peas), and Triticum aestivum (wheat). Other host plants are Achillea magna (yarrow), Agropyron repens (quackgrass), Agrostemma githago (corn cockle), Alchemilla arvensis (ladys-mantle), Allium cepa (onion), Alyssum saxatile (golden-tuft), Anagallis arvensis (scarlet pimpernel), Armoracia rusticana (horseradish), Avena sativa (oats), Beta vulgaris (beet), Brassica napus (rape), Napobrassica Group (rutabaga), Brassica oleracea, Capitata Group (cabbage), Gemmifera Group (brussels-sprouts), and Gongylodes Group (kohlrabi), Brassica rapa, Rapifera Group (turnip), Calendula arvensis (calendula), Cardaria draba, Carum carvi (caraway), Centaurea cyanus (cornflower), Centaurea montana (mountain bluet), Cerastium arvense (field chickweed), Cheiranthus cheiri (wallflower), Chrysanthemum sp. (chrysanthemum), Chrysanthemum coronarium (crown chrysanthemum), Chrysanthemum leucanthemum (oxeye daisy), Cichorium endivia (endive), Cichorium intybus (chicory), Cirsium sp. (thistle), Cirsium arvense (Canada thistle), Convolvulus athaeoides, Cynara scolymus (artichoke), Dactylis glomerata (orchardgrass), Daucus carota (carrot), Dianthus barbatus (sweet william), Echium vulgare (blueweed), Euphorbia sp. (spurge), Galium mollugo (smooth bedstraw), Helianthemum sp. (sun-rose), Helianthus annuus (common garden sunflower), Lactuca sativa (lettuce), Lepidium sativum (garden cress), Lolium perenne (perennial ryegrass), Malcolmia maritima (Virginian stock), Matricaria chamomilla (sweet false chamomile), Medicago sativa (alfalfa), Nasturtium officinale (watercress), Onobrychis viciifolia (sainfoin), Papaver rhoeas (corn poppy), Papaver somniferum (opium poppy), Petroselinum crispum (parsley), Phaseolus sp. (beans), Plantago sp. (plantain), Ranunculus acris (tall buttercup), Ranunculus arvensis (corn buttercup), Raphanus sativus (radish), Reichardia tingitana, Rumex acetosella (common sorrel), Rumex crispus (curly dock), Rumex patientia (spinach dock), Sambucus racemosa (European red elderberry), Scilla sp. (squill), Secale cereale (rye), Sinapis alba (white mustard), Sisymbrium sp., Solanum tuberosum (potato), Spinacia oleracea (spinach), Stellaria media (common chickweed), Taraxacum officinale (dandelion), Trifolium sp. (clover), Trifolium pratense (red clover), Tulipa sp. (tulip), Tussilago farfara (coltsfoot), Vicia faba (broadbean), and Viola tricolor (pansy) (Bonnemaison and Bournier 1964, Franssen and Huisman 1958, Priesner 1928, 1960, zur Strassen 1977).

General Distribution

T. angusticeps occurs throughout most of Europe and the European part of the Soviet Union. It also occurs in Azerbaijan SSR, Georgian SSR, Cyprus, Iran, Israel, Turkey, Egypt (northern part, Sinai), Libya (northern part), Morocco, Canary Islands, and Madeira Islands (Dyadechko 1977, Morison 1957, Priesner 1928, 1960, zur Strassen 1977).



Thrips angusticeps distribution map prepared by Non-Regional Administrative Operations Office and Biological Assessment Support Staff, PPQ, APHIS, USDA

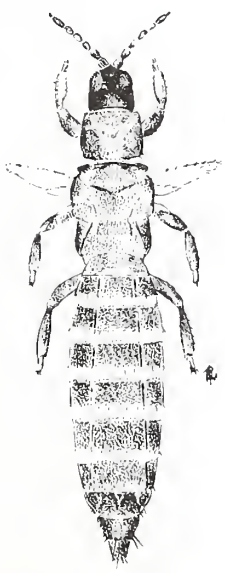
Characters

ADULT FEMALE (Figs. 6-7) - Body rather slender, length about 1 mm. Brown with orange subintegumental color in thorax; antennal segment III, basal parts of IV and V, tarsi and most of foretibia light yellowish brown; ocellar crescent red; macropterous forewings light grayish brown, basal one-third pale; body and forewing setae brown.

(Fig. 6)

Thrips angusticeps adult female (Macroptera), dorsal view (From Bonnemaison and Bournier 1964).

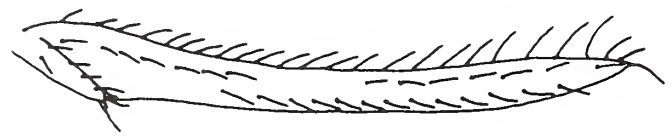
(Fig. 7)



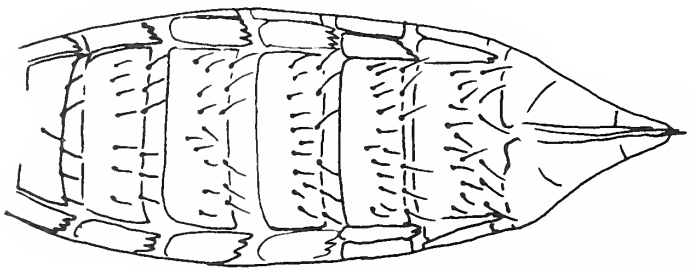
Thrips angusticeps adult female (Brachyptera), dorsal view (From Bonnemaison and Bournier 1964).

Antennae 7 segmented. Head somewhat square with sides almost parallel, transversely striated caudad of eyes; ocellar setae pair II antero-laterad of anterior ocellus, near margin of eye; ocellar setae pair III between anterior and posterior ocelli, outside ocellar triangle; ocellar pair I absent. Pronotum transversely reticulated; 2 pairs of moderately long posteroangular setae, 65-75 µm; normally 4 pairs of shorter posteromarginal setae between posteroangular setae. Metanotum without pores; middle 2 setae positioned in about anterior one-fourth of notum. Macropterous forewings extending beyond middle of abdomen; 4-8 setae on distal half of first vein (Fig. 8A); brachypterous forewings extending just beyond metathorax. Abdominal tergite II with 3 lateral setae; V-VIII with submarginal ctenidia on each side; VIII with complete posteromarginal comb, microtrichia of comb in groups; IX with 2 pairs of pores; sternite I with 2 minute setae on antero-medial margin; II-VII with accessory setae in 1 or more rows (Fig. 8B); pleurotergites without accessory setae medially.

(Fig. 8)



A



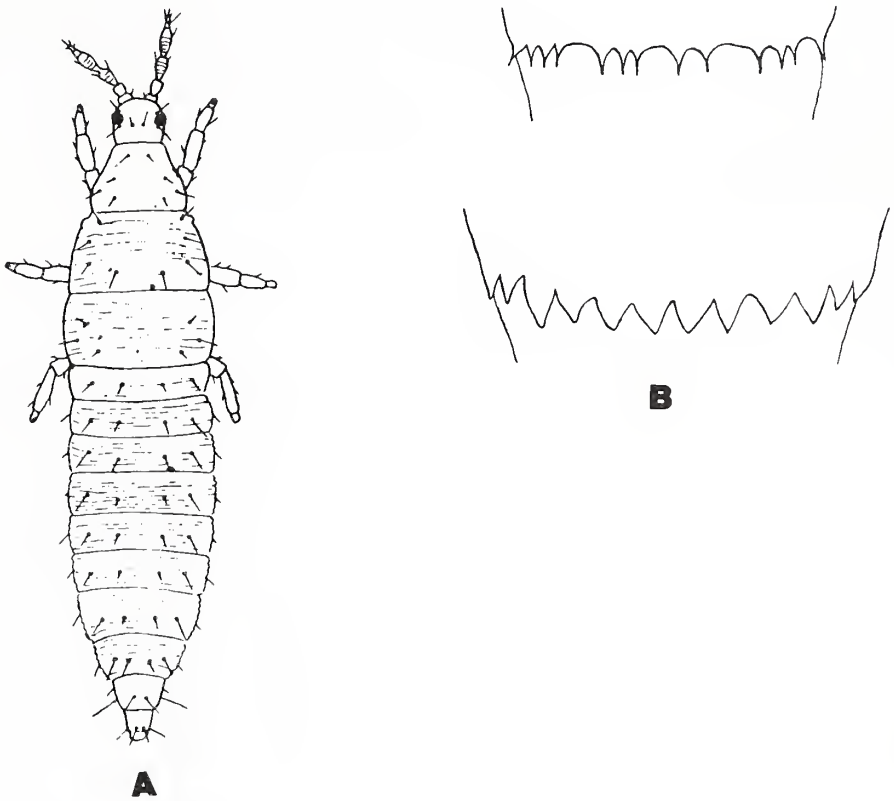
B

Thrips angusticeps adult. A. Forewing (all fringe cilia omitted). B. Female abdominal sterna II-X (all setae omitted except primary and accessory setae II-VII), ventral view (From U.S. Department of Agriculture 1962).

MALE - Smaller but similar in color to female; abdominal sternites III-VII with oval glandular area.

LARVA (Fig. 9A) - Pale yellow; abdominal segment VIII with comb of relatively stout teeth on posteromargin, middle 4 pairs of teeth subequal, 2 lateral pair smaller (Fig. 9B).

(Fig. 9)



Thrips angusticeps larva. A. Dorsal view. B. Posterior marginal comb on abdominal tergum VIII: Top - first stage; Bottom - second stage (From U.S. Department of Agriculture 1962).

The macropterous and brachypterous forms, brown body, macropterous forewing with 4-8 distal setae, accessory setae on abdominal sternites, and complete comb on posteromargin of tergite VIII differentiate this species from the Thrips spp. in North America.

Characteristic Damage

Seedlings and young plants are distorted, stunted, or killed. The leaves have silvery, yellow, or brown spots, may be mottled, puckered, crinkled, or edges curled. Leaves of young wheat have brown tips and leaves of winter cereals have silvery spots which later turn yellow or brown. Flax plants are stunted, stems have silvery spots, growing terminals are dead, and stems ramified. According to Franssen and Mantel (1962), half-grown flax plants turn yellowish gray, tops are erect instead of bending naturally, leaves assume a more horizontal position in relation to the stem, and terminals appear swollen; later, the leaves drop from 5-10 cm of the tops (Fig. 10).

(Fig. 10)

Thrips angusticeps damage to flax plants: Right - plants damaged by nymphs of macropterous generation. Left - healthy plants (From Franssen and Huisman 1958). Photograph made by Plant Protection Service, Wageningen, The Netherlands. Reproduced with the permission of the Research Institute for Plant Protection, Wageningen, The Netherlands.

Detection Notes

T. angusticeps is frequently intercepted from Europe in agricultural quarantine, mainly on vegetables (lettuce, parsley, watercress, mustard greens, cabbage, and endive) and infrequently on cut flowers in aircraft stores and quarters

and ship stores. It has been intercepted on artichokes and various cut flowers in passenger baggage, but rarely has it been found in commercial shipments of cut flowers.

In the field, look for characteristic damage to seedlings and young plants in spring. Small, brown, rather slender thrips with brachypterous wings feed on the leaves and growing terminals. During summer, look for macropterous adults and yellow larvae in flowers and seed heads.

Biology

A macropterous first generation and brachypterous second generation occur in Europe. According to Priesner (1960), three generations occur in Egypt. Population density of the overwintering adults is directly correlated to weather conditions during the summer. After a cool, wet summer, the population may be 90 percent lower than after a dry, hot summer. Heavy rains during the migration of larvae to the soil drown many larvae in the soil (Franssen and Huisman 1958).

In the Netherlands, overwintering brachypterous adults emerge in early spring from the soil when the soil temperature reaches at least 5.5° C for several days, and emerge over 2-3 months. Adults may also remain in the soil and hibernate for another year. The adults cannot fly and thus feed on seedlings and young plants in the immediate vicinity of their emergence sites. If food is not available, the adult can survive for 4 days at air temperature of 4° C. Eggs are laid in slits on the tender leaf. Larvae appear in early May and feed on the vegetative parts of plants. Macropterous adults appear in late May and early June when flax is starting to flower, and feed on the flowerbuds, ovaries, and young seed pods. They prefer flax and to a lesser degree, barley, wheat, and peas. Eggs are laid mainly on these crops. Larvae of the second generation feed on the flowers and young seed pods, then migrate to the soil. Two-thirds of the larvae are found at depths of 30-50 cm and some burrow as deep as 80 cm. The larvae pupate and transform into brachypterous adults which remain in soil until spring (Franssen and Mantel 1965). According to Buhl (1934), larvae of the second generation in Germany feed for 8-14 days, then migrate to soil in late July and in August. After a rest period, they pupate; the pupal stage lasts 6-9 days.

In France, brachypterous adults appear between March 5-10 in the northern coastal region and do not become a problem until the middle of April in the northwestern and Paris areas. Some adults do not emerge but remain in diapause for 20 months. Adults lay eggs 10-15 days after emergence; each adult lays

fewer than 50 eggs. The first generation consists of macropterous adults and a few brachypterous adults. Macropterous adults migrate to flax and peas. This thrips lives on many adventitious hosts, mainly mustard, and many cultivated crops (Bonnemaison and Bournier 1964).

Controls

To reduce damage, crop rotation is recommended. Crops which are not preferred by the macropterous adults are planted for two consecutive summers before planting a preferred crop again. Other recommendations are to plant nonsusceptible or less susceptible crops or to plant late crops to escape the brachypterous adults. When susceptible crops are planted in fields infested with brachypterous adults, chemical control may be necessary (Franssen and Huisman 1958).

Literature Cited

Bonnemaison, L.; Bournier, A. Les thrips du lin Thrips angusticeps Uzel et Thrips linarius Uzel (Thysanopteres). Ann. Epiphyties 15(2):97-169; 1964.

Buhl, C. Beitrag zur biologie des Thrips angusticeps Uz. Anz. Schadlingsk. 10(3):31-34; 1934. Taken from: Rev. Appl. Entomol. Ser. A 22(5):267-268; 1934.

Dyadechko, N. P. Thrips or fringe-winged insects (Thysanoptera) of the European part of the USSR. Published for Agricultural Research Service, U.S. Department of Agriculture, and National Science Foundation, Washington, DC. New Dehli: Amerind Publishing Co. Ltd.; 1977.

Franssen, C. J. H.; Huisman, P. The biology and control of Thrips angusticeps Uzel. Versl. Landbouwk Onderz. No. 64; 1958. (In Dutch.)

Franssen, C. J. H.; Mantel, W. P. Thrips in flax and their importance in flax cultivation. Versl. Landbouwk. Onderz. No. 68; 1962. (In Dutch.)

_____. The prediction of damage by brachypterous Thrips angusticeps Uzel in spring. Landbouwk. Tijdschrift 75(3): 121-132; 1963. (In Dutch.)

_____. Thrips in cereal crops (Biology, economic importance and control). 1. Biology. Versl. Landbouwk. Onderz. No. 662: 1965. (In Dutch.)

Jary, S. G. A note on injury caused by two species of Thysanoptera. J. S., E. Agric. Coll. Wye 34:63-64; 1934. Taken from: Rev. Appl. Entomol. Ser. A 22(9):511; 1934.

Ministry of Agriculture, Fisheries and Food. Thrips on peas. Advisory Leaflet No. 170, revised. United Kingdom: Ministry of Agriculture, Fisheries and Food; 1981.

Morison, G. D. A review of British glasshouse Thysanoptera. Trans. R. Entomol. Soc. London 109(16):467-534; 1957.

Priesner, H. Die Thysanopteren Europas. Wagner-Verlag, Wien; 1928.

_____. A monograph of the Thysanoptera of the Egyptian deserts. Inst. Desert Egypte 13; 1960.

U.S. Department of Agriculture, Agricultural Research Service, Plant Pest Control Division. Insects not known to occur in the United States. Cabbage thrips (Thrips angusticeps Uzel). U.S. Department of Agriculture Coop. Econ. Insect Rep. 12:1-24; 1962.

Wetzel, T. Untersuchungen zum Auftreten, zur Schadwerkung un zur Bekaampfung von Thysanopteren in Grassamenbestanden. Beitr. Entomol. 14(3-4):427-500; 1966. Taken from: Rev. Appl. Entomol. Ser. A 54(2):101; 1966.

zur Strassen, R. Internationales forschungsprojekt Makoronesischer raum. Studie zur fruhjahrsfauna der fransenflugler auf den Madeira Inseln im Atlantik nebst daten sur abundanz und faunistik (Insecta: Thysanoptera). Bol. Mus. Municipal Funchal 31(134):5-78; 1977.